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5 A PRINTER HAVING A THESAURUS FEATURE

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7 The present invention generally relates to a printer having
8 enhanced features, and more particularly to a printer adapted to provide print
9 services and further adapted to provide thesaurus services so that a user may
10 enhance the vocabulary/terminology appearing in a computer-generated
11 document.

12 Computer-based word processing software packages are
13 becoming increasingly more sophisticated. For example, many word
14 processing software packages include a variety of features intended to enhance
15 the document creation process, such as a vocabulary-enhancing thesaurus
16 feature that provides a user with a selection of alternative word choices. A
17 thesaurus software feature/package, which may be stored on and executed by
18 the user's computer, typically has one or more databases including, for
19 example, a database having alternative word choices cross-referenced in an
20 appropriate manner. However, these databases are often large and thus, limit
21 the amount of the user's computer memory that is available for other software
22 packages. As a result, word processor software packages that include a
23 thesaurus feature often require more memory than was required for the use of
24 earlier word processor software packages.

1 In addition, personal digital assistants (PDAs) are becoming more
2 widely used and, with the advent of wireless communication systems like
3 Bluetooth, allow users to access print services offered by a printer.
4 Unfortunately, PDA's typically do not include the amount of memory required
5 to support an enhanced software feature such as a thesaurus software feature.
6 Thus, PDA users, although able to print a document at a printer, are unable to
7 enhance the terminology in the document because they lack access to a
8 thesaurus software package.

9 Further, when used in the context of a computer network,
10 thesaurus software features/packages and associated databases are often stored
11 on a server computer that is communicatably coupled to a set of user computers
12 that may access and operate the software packages stored on the server.
13 However, when the network server is off-line, i.e., not able to communicate
14 with other network devices, the user can no longer access the features available
15 via the server. Thus, time-critical documents that need to be completed/printed
16 immediately are delayed until the server is repaired and placed back into
17 service. As a result, computer networks are often designed to include
18 additional and/or redundant servers so that network services are not greatly
19 affected when one of the servers goes off-line. However, even these additional
20 servers may become inaccessible to the network computer users during a
21 network crash that causes all network communication to cease.

22 In addition, network server computers are often used to support a
23 number of network services such that communication traffic between the server
24 and the network computers may become too heavy causing communication on
25 the network to slow down and, in some cases, causing the network to crash and
26 become inoperable.

27 Moreover, to conserve resources, computer networks typically
28 provide multiple users with access to a limited number of printers. Thus, many
29 of the network users are remotely located from the nearest printer such that the
30 computer users have to travel to the printer to collect their printed documents.

1 However, the document creation process can be especially frustrating to a
2 computer user who, after sending a document to a remotely located printer,
3 remembers that the document is unfinished because he forgot to use the
4 thesaurus software feature/package to enhance the terminology/vocabulary in
5 the document. As a result, the paper on which the unfinished document is
6 printed is wasted and, if the user unnecessarily walked to the remotely located
7 printer before remembering that the document is unfinished, then time is also
8 wasted.

9 BRIEF DESCRIPTION OF THE DRAWINGS

10 FIGURE 1 is a block diagram of a print apparatus that is coupled
11 to a user's computer and that provides the user with a thesaurus program
12 according to one aspect of the present invention;

13 FIG. 2 is a block diagram of a print apparatus that is coupled to a
14 set of users' computers via a communication network and that provides the set
15 of users' computers with a thesaurus program according to another aspect of the
16 present invention;

17 FIGs. 3A and 3B depict a flow chart representing a method for
18 operating the thesaurus program of the print apparatus of FIGs. 1 and 2
19 according to a further aspect of the present invention;

20 FIGs. 4A, 4B and 4C depict a flow chart representing a method
21 for operating the thesaurus program of the print apparatus of FIGs. 1 and 2
22 according to a further aspect of the present invention; and,

23 FIG. 5 is a flow chart representing a method for operating the
24 thesaurus program of the print apparatus of FIGs. 1 and 2 according to yet a
25 still further aspect of the present invention.

26

27 SUMMARY OF THE INVENTION

28 The present invention is directed to a print apparatus having a
29 thesaurus program that enables the enhancement of the terminology in a

1 computer-generated document. The print apparatus includes a processor for
2 executing a thesaurus program and a memory for storing the thesaurus
3 program. A control panel and a display unit associated with the print apparatus
4 enable user interaction with the thesaurus program. The print apparatus may
5 also be coupled to a computer network to provide a plurality of computers that
6 are coupled to the network with access to the thesaurus program.

8 DETAILED DESCRIPTION

9 Referring now to the drawings wherein like reference numerals
10 refer to similar or identical parts throughout the several views, and more
11 specifically to FIG. 1 thereof, a computer 10 includes a central processing unit
12 (CPU) 12 that executes an editor program 14 to enable the creation, formatting
13 and editing of computer-generated documents that are stored as document files
14 in a memory 16. A monitor 18, keyboard 20 and mouse 22 enable
15 communication between a user and the CPU 12. Although not shown in FIG.
16 1, the computer 10 may further include any number of peripheral devices
17 including, for example, a modem, a sound card, a video card, etc. Further, the
18 computer 10 need not be a stationary device but may be implemented with a
19 laptop computer or even with a personal digital assistant (PDA). Moreover, the
20 computer 10 may include a wireless communication device (not shown) that
21 enables wireless communication.

22 A print driver 24 is also coupled to the CPU 12 for formatting
23 document files stored in the memory 16 for printing at a print apparatus, such
24 as a printer 26, which is coupled to the computer 10 via, for example, a printer
25 cable 28. The printer 26 includes a processor 30 that executes a set of software
26 programs stored in the memory 36, including, for example, a thesaurus
27 program 34 and an editor program 32. In addition, software programs that
28 enable communication between the printer 26 and the computer 10 and that
29 further enable the printing of documents supplied to the printer 26 by the
30 computer 10 may also be stored in the memory 36. In addition to software

1 programs, the memory 36 includes one or more directories designated to store
2 document files received at the printer 26 from the computer 10.

3 The printer 26 further includes a print module 25 that, under
4 control of the processor 30, enables the printing of documents. The print
5 module 25 may be implemented using any combination of hardware, firmware
6 and software necessary to enable conventional printer functionality. Further,
7 although depicted as separate components, the processor 30 and the print
8 module 25 may be combined to form a single print module.

9 A reformatter driver 23, which may be implemented via software
10 and/or firmware that is executed by the processor 30, is also coupled to the
11 processor 30 and reformats document files that have been edited at the printer
12 26. Specifically, conventional print modules are configured to print documents
13 having a specific, print ready format, such as PCL or postscript. As a result,
14 documents are conventionally supplied to a print module in the print ready
15 format. However, editing a document file at the printer 26 may alter the format
16 of the document file causing the print module 25 to be unable to print the
17 document file. Thus, a reformatter driver 23 is provided to reformat document
18 files that have been edited at the printer 26 so that the documents may be
19 printed by the print module 25. As a result, the software or firmware used to
20 implement the reformatter driver 23 is configured to received a document file
21 in a print ready format, locate edited material (improperly formatted material)
22 located in the document file, and convert the edited material to a proper, print
23 ready format. Further, print ready formats such as PCL and postscript are
24 widely available and well known in the art.

25 A display device 38 such as, for example, a liquid crystal display
26 device, may be disposed on the printer 26 for displaying information generated
27 by the processor 30 and one or more software programs stored in the memory
28 36 enable control of the display device 38 by the processor 30. In addition, a
29 control panel 40 may be disposed in the printer 26 at a location near the display
30 device 38 so that the user may supply information to the processor 30 while

1 viewing the display device 38. The control panel 40 may include, for example,
 2 a set of keys similar to those included on a conventional keyboard or may
 3 instead include fewer keys tailored to support the functionality of the printer
 4 26. As will be understood by one having ordinary skill in the art, display
 5 devices, control panels and software for operating such devices are widely
 6 available. Moreover, such devices are adaptable for usage within a print
 7 apparatus in much the same manner that such devices operate within
 8 conventional computer systems.

9 The printer 26, instead of being physically coupled to the
 10 computer 10 may be wirelessly coupled to the computer 10. Specifically, the
 11 printer 26 may include a wireless communication device (not shown) that
 12 enables communication with the wireless communication device (not shown)
 13 disposed in the computer 10. In addition, the computer 10 and printer 26 may
 14 communicate using a wireless communication protocol such as Bluetooth.

15 Referring now to FIG. 2, in a second embodiment, the computer
 16 10 may comprise one of a plurality of computers 10 all of which may be
 17 coupled to a communication network 42 that is controlled by a network server
 18 computer 44. In addition, the printer 26 may be coupled to the communication
 19 network 42 and may provide print services to all of the computers 10 coupled
 20 to the network 42.

21 If coupled to the communication network 42, the memory 36
 22 disposed in the printer 26 may include a plurality of directories each associated
 23 with one of the computers 10 and each designated to store documents received
 24 from the associated computer 10. The processor 30 disposed in the printer 26
 25 may maintain a print queue (not shown) containing the names of the document
 26 files stored in the various directories arranged according to the order in which
 27 the document files were received from the computers 10. The processor 30
 28 may further print the document files in the order that the names of the
 29 document files are arranged in the print queue. If one of the document files
 30 listed in the master list is selected by a user for editing, then the processor 30

1 may temporarily remove the name of the selected document file from the print
2 queue until editing of the selected document file is complete.

3 As described with respect to FIG. 1, the printer 26 and computers
4 10 shown in FIG. 2 may be adapted to communicate wirelessly. Specifically,
5 the network 42 may comprise a wireless communication network. For
6 example, the printer 26 and computers 10 may be adapted to include wireless
7 communication devices (not shown) that enable wireless communication via a
8 wireless communication protocol such as Bluetooth. Alternatively, the
9 computers 10 may be adapted to access the printer 26 via a telephone modem.

10 Referring now to FIG. 3 and to FIGs. 1 and 2, the thesaurus
11 program 34 may be invoked and operated via the control panel 40 disposed in
12 the printer 26 using a method 50 that begins when a user instructs the computer
13 10 to send a document file to the printer 26 (step 52). In response to the
14 instruction, the CPU 12 sends the document file from the memory 16 to the
15 print driver 24 which formats the document file for printing thereby converting
16 the document file into a PCL or a postscript format (step 54). Next, the
17 formatted file is transmitted to the printer 26 where the processor 30 stores the
18 formatted file in the memory 36 (step 56). The processor 30 causes the print
19 module 25 to print a copy of the file while leaving a copy in the memory 36
20 (step 58). The copy of the document file is retained in the memory 36 so that
21 additional copies may be printed and so that a user may invoke the thesaurus
22 program 34 to enhance the language in the document file, if desired. More
23 particularly, a user stationed at the printer 26 may use the control panel 40 and
24 display 38 to access the memory 36 and locate/open the document file stored in
25 the memory 36 (step 60). Next, the user may invoke the editor program 32
26 using the control panel 40 so that the language in the document file may be
27 enhanced, if desired (step 62). As will be understood by one having ordinary
28 skill in the art, the document file stored in the memory 36 has either a PCL
29 format or a postscript format, both of which are editable using a basic editor
30 program such as, for example, vi, also known as visual editor, emacs or the

1 DOS "Edit" command. After invoking the editor program, the user identifies
2 one or more words for which the user would like to substitute a synonymous
3 term or for which the user may choose to view antonyms (step 64).

4 Upon identifying a term, the user selects the term by, for
5 example, causing the term to be highlighted and then invokes the thesaurus
6 program 34 (step 66). The thesaurus program 34 may be selectable using a
7 pull-down menu. Alternatively, the user may enter the term into a data entry
8 field (not shown) that is displayed when the user invokes the thesaurus program
9 34. Referring also to FIG. 3B which aligns at connection point "a" with FIG.
10 3A, selecting the thesaurus program 34 causes the processor 30 to search a set
11 of databases associated with the thesaurus program 34 and stored in the
12 memory 36 for a set of words that are synonymous/antonymous with the
13 selected term (step 68). The searching conducted by the processor 30 may be
14 performed using the search techniques employed by conventional thesaurus
15 software programs.

16 The set of substitute words are then displayed on the display unit
17 38 (step 70). If desired, the user may choose to edit the document to
18 incorporate one of the substitute words causing the processor 30 to substitute
19 the chosen word for the term originally included within the document (steps 71
20 and 72). If none of the words is deemed a suitable substitute, the user may
21 instead forego editing the document (step 71). The user may then repeat the
22 steps 64-72 if there are any additional terms for which either synonyms or
23 antonyms are desired.

24 After using the thesaurus program 34, the user may instruct the
25 processor 30 to save the document file in the memory (step 73) and may then
26 instruct the processor 30 to print the document at which time the processor 30
27 transmits the document file to the reformatter driver 23 for reformatting (step
28 74). Reformatting of the document file is performed to ensure that the
29 document file is in a print ready format. Of course, the document was
30 originally supplied to the printer 26 in a print ready format. However, the

1 editing changes made at the printer 26 may have altered the document file in a
2 manner such that reformatting is required to enable printing of the document
3 file by the print module 25. Thus, the document file, which was originally
4 supplied to the printer in a print ready format but has been edited, is supplied to
5 the reformatter driver 23 which converts the document to a print ready format.
6 Finally, the processor 30 causes the reformatter driver 23 to transmit the
7 reformatted document file to the print module 25 (step 76) where the document
8 file is printed (step 78).

9 Referring now to FIG. 4A and to FIGs. 1 and 2, in an alternative
10 embodiment, the printer 26 may have greater editing capabilities such that the
11 original, non print-ready version of the document may be edited at the printer
12 26. For example, a method 80 for operating the thesaurus program 34 may
13 begin when a user instructs the computer 10 to send a document file from the
14 memory device 16 disposed in the computer 10 to the printer 26 for printing
15 (step 82). The document file may include any type of computer-generated file
16 that contains any printable matter. The CPU 12 responds to the instruction by
17 invoking the print driver 24 which creates and stores a print ready version of
18 the document file that is formatted according to a print format or protocol that
19 is compatible with a format used by the processor 30 and/or the print module
20 25 residing in the printer 26 (step 84). Preferably, the print driver 24 does not
21 alter the original version of the document file so that, after the print ready
22 version of the document file has been created/stored at the computer 10, two
23 versions of the document file reside in the memory 16, i.e., an original,
24 unconverted version and a print ready version.

25 Next, the print driver 24 transmits the print ready version of the
26 document file to the printer 26 for printing and further transmits the original
27 version of the document file to the printer 26 for editing, if desired (step 86).
28 Note that, unlike the original version of the document file, the print ready
29 version has been converted to a new format and may no longer be
30 readable/recognizable to the editor program 32 disposed in the printer 26.

1 Thus, the unconverted, original version of the document file is sent to the
2 printer 26 along with the print ready version so that, if desired, the document
3 file may be edited at the printer 26 before being printed. Of course, if the
4 format of the print ready version is recognizable to the editor program 32 and
5 thus editable at the printer 26, then only the print ready version need be
6 transmitted to the printer 26. Alternatively, the original version of the
7 document file may be transmitted to the printer 26 and, if desired, edited at the
8 printer 26. After the original version has been edited, the processor 30
9 disposed in the printer 26 causes the reformatter driver 23 to convert the
10 document file to a print ready format for printing. In this embodiment, the
11 reformatter driver 23 may be implemented with a conventional print driver 24.

12 As described, upon receipt of the two versions of the document
13 file at the printer 26, the processor 30 disposed in the printer 26 causes the
14 original and print ready versions of the document file to be stored in the
15 memory 36 (step 88). If the thesaurus program 34 is installed in the printer 26
16 coupled to the network 42 (see FIG. 2), then the processor 30 causes the
17 document files received from the computer 10 to be stored in a directory
18 associated with the computer 10 from which the document files were received.
19 Although the processor 30 may use any desired naming/storing scheme for
20 naming/storing the document files received from the computer 10, the naming
21 scheme preferably includes storing the documents under names that are
22 recognizable to the user so that, if editing at the printer 26 is desired, the user
23 can identify the document file to be edited.

24 In addition to storing the two versions of the document files, the
25 processor 30 disposed in the printer 26 also causes the name of the print ready
26 version of the document file to be added to a print queue that contains the
27 names of all pending print jobs and that is used to control the order in which
28 document files stored in the printer memory 36 are printed (step 90). The
29 processor 30 maintains the print queue in a manner such that, as each document
30 file is printed, the name of the printed document file is removed from the print

1 queue and the next consecutive document file listed by name in the print queue
2 becomes the next document file to be printed. If the thesaurus program 34 is
3 installed in the printer 26 coupled to the network 42 (see FIG. 2), then the name
4 of the document file added to the print queue may further include the
5 pathname/directory in which the document file is stored so that the processor
6 30 can locate the document file for printing.

7 Next, while stationed at the printer 26, the user invokes the
8 thesaurus program 34 using the control panel 40 (step 92). The user may
9 invoke the thesaurus program 34 using any conventional method. For example,
10 the user may press an appropriate one of the keys disposed on the control panel
11 40 thereby selecting an icon displayed on the display unit 38 and associated
12 with the thesaurus program 34. Alternatively, the processor 30 may operate as
13 a menu driven system wherein a set of programs/features are selectable via one
14 or more pull-down menus.

15 After the thesaurus program 34 has been invoked, the processor
16 30 prompts the user to identify the document file to be processed by the
17 thesaurus application 34 (step 94). If the thesaurus program 34 is installed in
18 the printer 26 that is coupled to a plurality of computers 10 via a network 42
19 (see FIG. 2), then the processor 30 may prompt the user to enter the name of
20 the document file to be edited and the name of the directory in which the
21 document file is stored. Of course, in order to do so, the user must be pre-
22 informed as to the name of the directory in which the user's document files are
23 stored.

24 Provided that the identified document file has not yet been
25 printed, the processor 30 removes the name of the identified document file
26 from the print queue to ensure that any editing performed while using the
27 thesaurus program 34 is incorporated into the printed version of the document
28 (step 96). Referring also to FIG. 4B which aligns with FIG. 4A at connection
29 point "a," in addition to removing the name of the print ready version of the
30 document file from the print queue, the processor 30 opens and, depending on

1 the size of the display unit 38, displays all or a portion of the original version of
2 the document file on the display unit 38 (step 98). Of course, if only a portion
3 of the document file is viewable at a single time, then the control panel 40 will
4 include keys that allow the user to scroll through the text of the document
5 causing the remaining portions of the document file to be viewable.

6 To ensure that the document file is not printed before the user has
7 had adequate time to edit the document file using the thesaurus program 34, the
8 print driver 24 disposed in the computer 10 may allow the user to indicate,
9 upon transmitting the original and print ready versions of the document file to
10 the printer 26, whether the print ready version of the document file shall be
11 printed immediately or whether printing of the document file shall be delayed
12 by an amount of time sufficient to allow the user to edit the document file using
13 the thesaurus program 34 at the printer 26. Alternatively, the processor 30
14 disposed in the printer 26 may automatically delay the printing of all document
15 files received at the printer 26 for a period of time sufficient to allow the user to
16 invoke the thesaurus program 34, should such usage be desired. Additionally,
17 if the document file is not edited at the printer 26 within the printing delay time
18 period, then the processor 30 may delete the unconverted version of the
19 document file from the printer memory 36 automatically at the end of the
20 printing delay time period.

21 In yet another embodiment, the print driver 24 may allow the user
22 to specify that the document file shall be sent to the printer 26 for storage but
23 not printed. Thus, the user will have an unlimited amount of time to edit the
24 document at the printer before printing. To ensure that the memory 36 in the
25 printer 26 does not become overloaded, the processor 30 disposed in the printer
26 may cause files to be deleted after a desired time period such as, for example,
27 twenty four hours. Alternatively, the printer 26, upon receiving the document
28 file may cause the document file to be printed but retain an editable copy of the
29 document file in the memory 36 in case additional changes are desired.

1 Next, assuming that the document file has been successfully
2 opened for editing, the user may identify one or more words in the document
3 file for which the user would like to substitute a synonymous term or for which
4 the user may choose to view antonyms. After identifying a term, the user
5 selects the term by, for example, causing the term to be highlighted and then
6 selects a search feature associated with the thesaurus program 34. The search
7 feature may be selectable using a pull-down menu provided by the thesaurus
8 program 34. Alternatively, the user may enter the term into a data entry field
9 (not shown) that is displayed when the user invokes the thesaurus program 34.
10 In either event, selecting the search feature causes the processor 30 to search a
11 set of databases associated with the thesaurus program 34 and stored in the
12 memory 36 for a set of words that are synonymous/antonymous with the
13 selected term (step 102). The searching conducted by the processor 30 may be
14 performed using the search techniques employed by conventional thesaurus
15 software programs.

16 The set of substitute words are then displayed on the display unit
17 38 (step 104). If desired, the user may choose one of the substitute words
18 causing the processor 30 to substitute the chosen word for the term originally
19 included within the document (step 106). If none of the words is deemed a
20 suitable substitute, the user may instead choose to close a window in which the
21 set of substitute words is displayed (step 106). Referring also to FIG. 4C which
22 aligns with FIG. 4B at connection point "b," the user may then repeat the steps
23 100-106 if there are any additional terms for which either synonyms or
24 antonyms are desired (step 107) or, if there are not any additional terms that
25 require substitution, then the user may exit the thesaurus program 34 (step
26 108).

27 Upon exiting the thesaurus program 34, the processor 30 may
28 generate a prompt asking whether the user wishes to save the revised version of
29 the document file (step 110). If the user elects to save the revised version of
30 the document file, the processor 30 causes the revised version of the document

1 file to be stored in the memory 36 and then causes the reformatter driver 23 to
2 create and store a print ready version of the revised document file for printing
3 (step 112). Of course, if the thesaurus program 34 is installed in a printer 26
4 that is coupled to a network 42 of computers 10, the processor 30 stores the
5 document file in the directory associated with the user's computer and deletes
6 or overwrites the earlier, unrevised version of the document file. If the user
7 does not choose to save the revised version of the document, then the processor
8 30 is done processing the document file (step 146).

9 If instead the revised print ready version of the document file has
10 been saved, the processor 30 transmits a prompt to the CPU 12 for display at
11 the computer 10 (step 114). The prompt may remind the user that the revised
12 document file has been saved in the memory 36 and indicate that the user may
13 upload the revised version of the document file from the printer 26, if desired.

14 Upon viewing the prompt that indicates that the revised version
15 of the document file has been stored in the memory 36, the user may elect to
16 upload the revised version of the document file from the printer 26 to the
17 memory 16 disposed in the computer 10 (step 116), or, if the user does not
18 wish to upload the document file, the user may instead close the window
19 containing the prompt without uploading the document file (118).

20 Next, the processor 30 generates a prompt asking the user
21 whether printing of the revised document is desired and further asking the user
22 to indicate whether the entire document file or only a subset of the document
23 file shall be printed (step 120). The prompt may further include a first button
24 that the user selects to indicate that printing of the document file is not desired,
25 a second button that the user selects to indicate that printing of the entire
26 document file is desired and a third button that the user selects to indicate that
27 only a subset of the document file is to be printed. If the first button is
28 selected, then the document file is not printed and the processor 30 is done
29 processing the documenting file (step 126). If either the second button or third
30 button is selected, then the processor 30 adds the name of the revised, print

1 ready version of the document file to the print queue for printing (step 122). If
2 the third button is selected, the processor 30 also receives and stores user-
3 entered data indicating the pages of the document file to printed (step 122).
4 When the name of the document file reaches the head of the print queue, the
5 processor 30 causes the document file to be printed by the print module 25
6 (step 124) either in whole or in part depending on what the user specified at the
7 step 92.

8 As will be appreciated by one of ordinary skill in the art, in order
9 to enable display and editing of the document file using the thesaurus program
10 34 in the manner described above, the thesaurus program 34 may be capable of
11 displaying and editing the document file in response to input entered by the
12 user. Thus, the thesaurus program 34 may include at least a minimal level of
13 text display and text editing capabilities. Alternatively, the thesaurus program
14 34 may execute in conjunction with the text/graphics editing program 32 (see
15 FIGs. 1 and 2) in a manner that is transparent to the user. In another
16 embodiment, the thesaurus program 34 may not be associated with any editing
17 capabilities in which case the user may simply use the thesaurus program 34 to
18 display possible term substitutes that the user may then enter into the document
19 via the editor program 32 that operates independently of the thesaurus program
20 34.

21 Referring now to FIG. 5 and to FIGs. 1 and 2, the thesaurus
22 program 34 may also be operated by a user stationed at the computer 10.
23 Specifically, a second method 130 for operating the thesaurus program 34 may
24 begin when the user invokes the thesaurus program 34 by, for example, using
25 the mouse 22 to click on an icon associated with the thesaurus program 34 (step
26 132). The icon may be displayed on the monitor 18 in much the same manner
27 as icons associated with software programs stored in the computer memory 10
28 are displayed such that the user is not even aware that the thesaurus program 34
29 is stored elsewhere, i.e., in the printer memory 36. As will be understood by
30 one of ordinary skill in the art, the icon will have to be loaded into the

1 computer 10 and associated with invoking the thesaurus program 34. For
2 example, clicking on the thesaurus program icon may cause the software
3 associated with the icon to provide a signal to the print driver 24 which may
4 send a signal that causes the printer processor 30 to begin executing the
5 thesaurus program 34.

6 After being invoked, the thesaurus program 34 may prompt the
7 user to enter a term for which a substitute word is desired (step 134).
8 Specifically, the thesaurus program 34 may cause the processor 30 disposed in
9 the printer 26 to generate the prompt (step 134) and may then cause the
10 processor 30 to transmit the prompt to the print driver 24 disposed in the
11 computer 10. Upon receiving the prompt, the print driver 24 forwards the
12 prompt to the CPU 12 which displays the prompt on the monitor 18 (step 136).
13 The prompt may include any message sufficient to cause the user to enter a
14 term and may include, for example, a data entry field into which the user may
15 type the term. The prompt may further include a user-selectable enter button
16 that, when clicked, causes the CPU 12 to transmit the entered term to the print
17 driver 24 which may then forward the term to the processor 30 disposed in the
18 printer 26 (step 138).

19 The processor 30, operating according to the thesaurus program
20 34, searches a database for an associated set of synonymous/antonymous words
21 and retrieves the associated set of substitute words therefrom (step 140). As
22 described above, the thesaurus program 34 may retrieve the set of substitute
23 words using conventional thesaurus software program search techniques. The
24 thesaurus program 34 then causes the processor 30 disposed in the printer 26 to
25 transmit the retrieved set of substitute words to the print driver 24 which
26 forwards the set of substitute words to the CPU 12 for display on the monitor
27 18 (step 142). The user may then select a desired one of the words to serve as a
28 substitute for the term originally included in the document file and may enter
29 the desired substitute word into the document in place of the original term (step
30 144). Preferably, although not necessarily, the document file is stored in the

1 memory 16 disposed in the computer 10 so that the document file may be
2 edited in the same manner used to edit any other document file stored in the
3 memory 16.

4 Alternatively, the user may decide that none of the set of words is
5 an appropriate substitute for the selected term in which case the user does not
6 enter any of the set of words into the document. After the user has finished
7 selecting from the set of words, the user may choose to use the thesaurus
8 program 34 to obtain substitute words for one or more other terms included in
9 the document file (repeat steps 134-144). Alternatively, the user may opt to
10 exit the thesaurus program 34 (step 146) by, for example selecting an exit
11 button associated with the display of terms. After editing the document, the
12 user may elect to have the document file printed, in which case the document
13 file is converted to a print ready format by the print driver 24 and then
14 transmitted to the printer 26 for printing.

15 According to another embodiment, during the second method 130
16 the document file may instead be stored in the printer memory 36 because, for
17 example, the user may have transmitted the document file to the printer 26 for
18 printing before invoking the thesaurus program feature 34. Provided that the
19 document file has not yet been printed, the thesaurus program 34 may cause the
20 processor 30 to transmit the document file to the computer 10 for editing and
21 may temporarily remove the name of the document file from the print queue.

22 When editing is complete, the CPU 12 transmits the edited
23 document file to the print driver 24 to create a print ready version of the
24 document file. The print ready version is then transmitted to the processor 30
25 disposed in the printer 26 and stored in the printer memory 36. Finally, the
26 processor 30 adds the name of the print ready version of the document file to
27 the print queue for printing.

28 Referring still to FIG. 5, the printer 26, computer 10 and
29 thesaurus program 34 may be adapted such that, when operated at the computer
30 10, the thesaurus program 34 behaves as though it were installed in the memory

1 16 disposed in the computer 10 in the same way that conventional network
2 computers operate remotely located software provided by conventional
3 network servers. In addition, the thesaurus program 34 may operate in a
4 manner that causes the thesaurus program 34 to appear fully integrated with the
5 editor program 14 installed in the computer 10 or with the editor program 32
6 installed in the printer 26. For example, the editor programs 14, 34 may each
7 include a pull-down menu having a thesaurus menu item that, when selected,
8 invokes the thesaurus program 34. Further, the thesaurus program 34 may
9 interact with either of the editor programs 14, 34 in a manner that is transparent
10 to the user such that the user is not even aware that the thesaurus is supplied via
11 a separate software program.

12 From the foregoing description, it should be understood that a
13 print apparatus adapted to provide thesaurus services has been shown and
14 described, having many desirable attributes and advantages. In particular, the
15 print apparatus allows a user to obtain thesaurus services while stationed at the
16 print apparatus. In addition, providing a print apparatus adapted to supply
17 thesaurus services eliminates the need to install a thesaurus software program
18 on the user's computer thereby conserving the space available on the user's hard
19 drive. Further, the print apparatus adapted to supply thesaurus services
20 provides a user with an additional safety net in the event that the computer
21 network crashes. Specifically, the print apparatus adapted to supply thesaurus
22 services may be used to identify substitute terms in a document that has been
23 sent to the print apparatus prior to the network crash. Thus, if after sending the
24 document to the print apparatus the user wishes to enhance the document by
25 substituting one or more of the terms in the document with
26 synonyms/antonyms, then the user may use the print apparatus to identify
27 substitute terms for the document even though the network is inoperable.

28 While various embodiments of the present invention have been
29 shown and described, it should be understood that other modifications,
30 substitutions and alternatives are apparent to one of ordinary skill in the art.

1 For example, as described herein, the print apparatus adapted to provide
2 thesaurus services may include a display unit and a control panel so that the
3 user may obtain thesaurus services directly from the print apparatus. In
4 addition, the print apparatus may also provide the thesaurus service to the user
5 via the user's computer.

6 Further, the computer 10 need not be a stationary device but may
7 instead be a mobile device such as a laptop computer or a personal digital
8 assistant (PDA). In addition, the computer 10 need not have editing
9 capabilities. Thus, for example, a person using a PDA having the ability to
10 download, display, and store, for example, e-mail messages may access the
11 thesaurus provided via the print apparatus 26. Specifically, the PDA user may
12 print an e-mail message at the print apparatus 26 and then use the thesaurus
13 while stationed at the print apparatus 26 to enhance the vocabulary in the e-
14 mail message. Moreover, the computer 10 or PDA need not communicate with
15 the print apparatus 26 via a hardwired connection but may instead be adapted
16 to communicate with the print apparatus wirelessly. For example, the print
17 apparatus 26 and the PDA may be adapted to include a wireless communication
18 device that enable communication via a wireless communication protocol such
19 as Bluetooth.

20 Further, the thesaurus program is described herein as being
21 invoked in response to the selection of a user-selectable icon or user-selectable
22 display menu. Alternatively, the thesaurus program may be executable in any
23 known manner. For example, the print apparatus may have a button located on
24 the control panel that, when pressed, invokes the thesaurus program.
25 Alternatively, the print apparatus may operate in any of a variety of modes, one
26 of which may be associated with the execution of the thesaurus program such
27 that placing the print apparatus into the proper mode causes the processor
28 disposed in the print apparatus to execute the thesaurus program.

29 In addition, the thesaurus program is described herein as
30 generating a set of display windows that enable user-interaction with the

1 program so that, for example, a term may be selected for processing.
2 Alternatively, the thesaurus program may generate text messages and accept
3 input in any of a variety of ways. For example, the thesaurus program may
4 generate messages/prompts that scroll across the display unit or across the
5 computer monitor. Further, instead of providing a window having a text field
6 into which a term may be typed, the thesaurus program may accept a user-
7 highlighted term as input.

8 Moreover, as described above, the print apparatus may provide
9 word processing or editing services that operate seamlessly with the thesaurus
10 service or may instead supply editing services that operate separately from the
11 thesaurus service.